The Need for State Legislation of Renewable Energy Certificates (RECs) to Include Geothermal Power Plants (GRECs) and Geothermal Power Plants that Remediate Brownfields (GBRECs)

Introduction

States have been working aggressively to develop new industries and create jobs that will endure. They also have been working to address the public's concerns about high energy prices, national security and global warming through their commitment to a renewable, clean energy economy. The development of geothermal power plants in Connecticut can help the State achieve its goals of green jobs, clean energy, energy efficiency, and pollution mitigation.

Connecticut support of GRECs and GBRECs can enable private companies to develop base load, renewable energy and to create jobs. RECs are purchased by the private sector utility companies to offset their mandate to include renewable energy in their blend of energy supply; there is no effect to the State of Connecticut's revenue stream.

Through the harvesting of heat from the earth, geothermal can cost-effectively and reliably produce a consistent supply of clean electricity to replace base load fossil fuel production (base load means supplying power on a 24/7 basis). The National Renewable Energy Laboratory at the Department of Energy (DOE) believes that geothermal has the potential to cut electricity costs by 25 to 50 percent.

Accessible geothermal heat exists in the Connecticut River Valley. (See Exhibit A: Generalized Bedrock Geologic Map of Connecticut, The Connecticut Geological and Natural History Survey.)

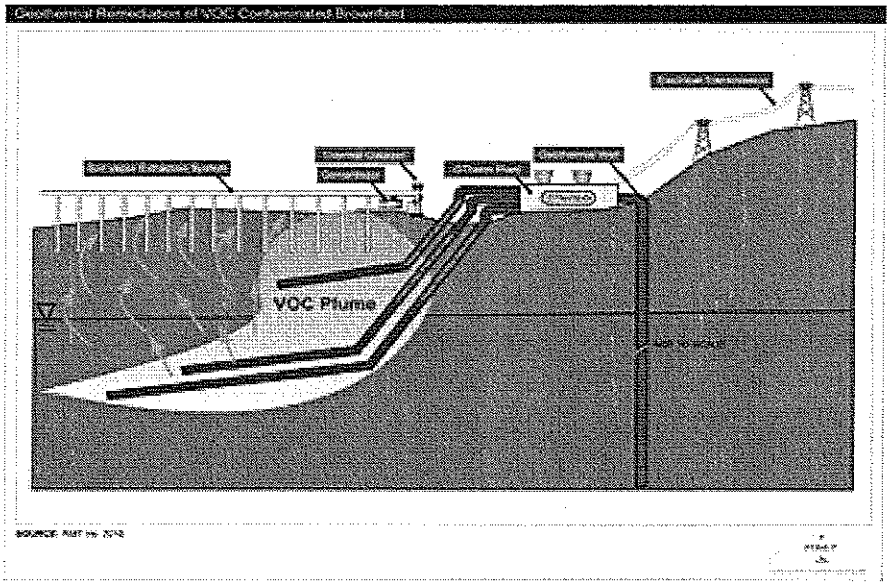
A recent advancement in geothermal utilizes an environmentally-benign, closed-loop approach that requires no hydraulic stimulation (hydrofracking) that can induce seismic activity and that can be implemented in the North East of the United States. (See Exhibit B: "Researchers Examine New England's EGS Potential, UMass Amherst New Office, November 10, 2010.)

Another breakthrough in geothermal technology is the development of a technique for utilizing the residual heat from a geothermal power plant to cost-effectively remediate brownfields contaminated with volatile organic compounds (VOCs) within months rather than years.

Energy and Technology Committee
Thursday, February 10, 2011
Proposed S.B. No. 200 AN ACT ESTABLISHING
GEOTHERMAL RENEWABLE ENERGY CREDITS

Elena Cahill
Globelé Energy, LLC

Remediation



Residual heat from a geothermal power plant is injected into a VOC Plume. Most VOCs vaporize at 100°C. Remediation takes months instead of years.

Benefits to the State of Connecticut

Support by the State of Connecticut of the building of geothermal power plants and the remediation of brownfields using residual heat from geothermal power plants can deliver significant benefits to the State:

- **Create a significant number of jobs and greatly expand revenue base**
  - 689 to 857 direct jobs are created by every 50 MW plant project (see Exhibit C: Green Jobs Through Geothermal Energy, Geothermal Energy Association, October 2010)

Start-up	13-30
Drilling -- primary well	32-47
Drilling – secondary well	59-69
EPC management	43-49
EPC construction	340-440
Operation and management	10-25
Power plant system manufacturing	192-197
Total Jobs Per Plant	689-857

  - Connecticut-based geothermal companies can pursue substantial project opportunities around the globe
    - $2.3 trillion is expected to be invested in global clean power in the next ten years

Pennsylvania	2010	$210.00
Pennsylvania	2011	$250.00

It is proposed that RECS for a geothermal plant (GRECS) should be valued based on its base load (24/7) capacity and that a geothermal plant should receive five (5) Class One standard RECs per MWh ($150 value). When using a geothermal plant to remediate brownfields, RECS for a geothermal plant built on a to-be-remediated brownfield (GBRECS) should receive fifteen (15) Class One standard RECS ($450 value).

Connecticut support of GRECs and GBRECs can enable private companies to develop base load, renewable energy and to create jobs. The State has the opportunity to provide financial support through legislation that has no impact on its budget.

Conclusion

Connecticut is asked to support the production of base load, renewable energy and brownfield remediation. By passing state legislation in support of GRECS and GBRECS, Connecticut would improve its overall economy, create jobs, accelerate the availability of green energy and return vitality to communities negatively impacted by surrounding polluted and contaminated lands. These objectives can be met with legislation that does not impact the State's budget.

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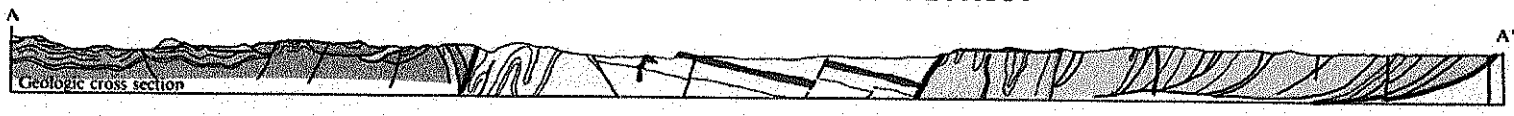
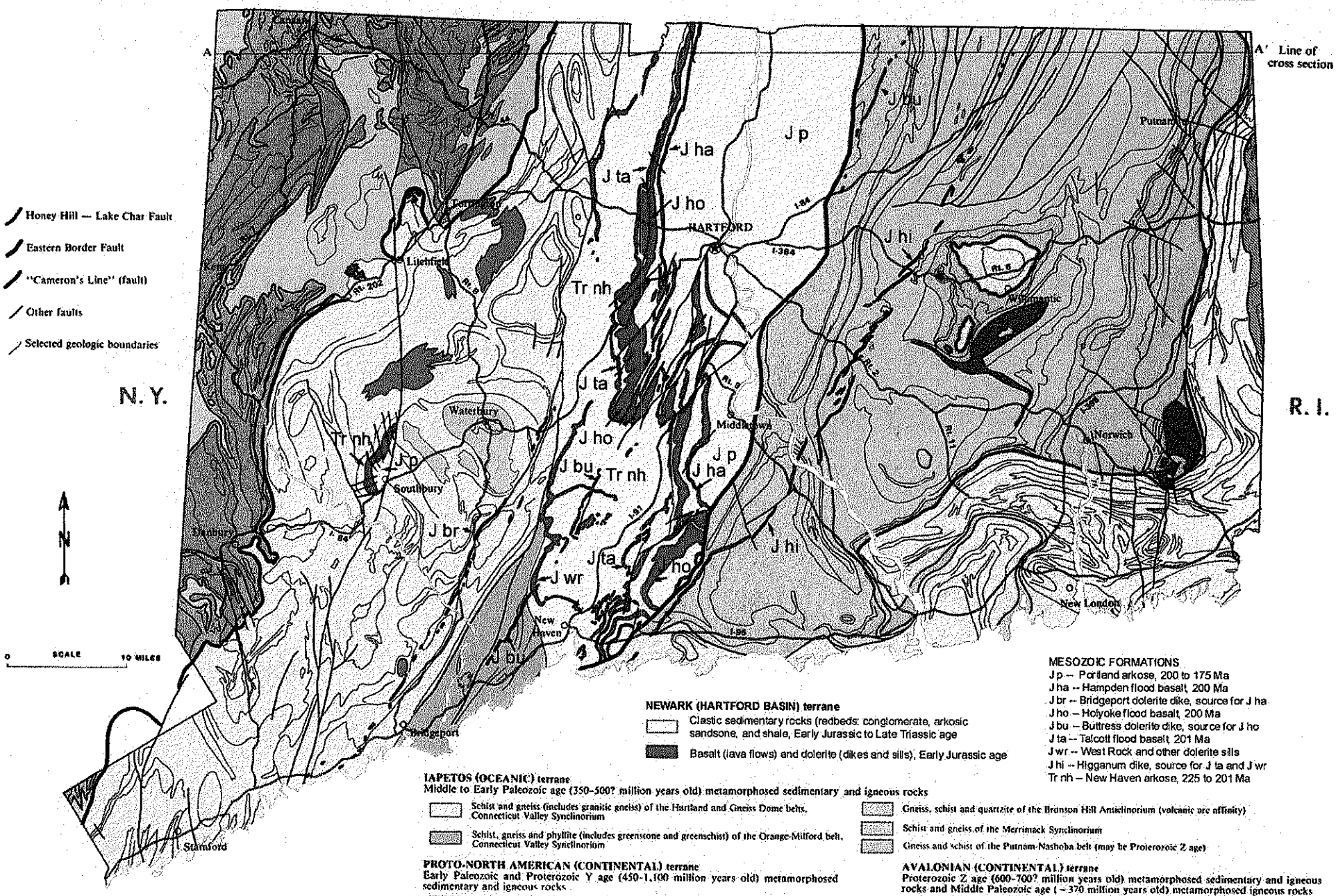
GENERALIZED BEDROCK GEOLOGIC MAP OF CONNECTICUT

THE CONNECTICUT GEOLOGICAL
& NATURAL HISTORY SURVEY
Department of
Environmental Protection
1990
reprinted 1996





NEWARK (HARTFORD BASIN) terrane

Clastic sedimentary rocks (redbeds: conglomerate, arkosic sandsone, and shale), Early Jurassic to Late Triassic age

Basalt (lava flows) and dolerite (dikes and sills), Early Jurassic age

MESOZOIC FORMATIONS

Jp -- Portland arkose, 200 to 175 Ma
J ha -- Hampden flood basalt, 200 Ma
J br -- Bridgeport dolerite dike, source for J ha
J ho -- Holyoke flood basalt, 200 Ma
J bu -- Buttress dolerite dike, source for J ho
J ta -- Talcott flood basalt, 201 Ma
J wr -- West Rock and other dolerite sills
J hi -- Higganum dike, source for J ta and J wr
Tr nh -- New Haven arkose, 225 to 201 Ma

IAPETOS (OCEANIC) terrane

Middle to Early Paleozoic age (350-500? million years old) metamorphosed sedimentary and igneous rocks

Schist and gneiss (includes granitic gneiss) of the Hartland and Gneiss Dome belts, Connecticut Valley Synclinorium

Schist, gneiss and phyllite (includes greenstone and greenschist) of the Orange-Milford belt, Connecticut Valley Synclinorium

Gneiss, schist and quartzite of the Bronson Hill Anticlinorium (volcanic arc affinity)

Schist and gneiss of the Merrimack Synclinorium

Gneiss and schist of the Putnam-Nashoba belt (may be Proterozoic Z age)

PROTO-NORTH AMERICAN (CONTINENTAL) terrane

Early Paleozoic and Proterozoic Y age (450-1,100 million years old) metamorphosed sedimentary and igneous rocks

Schist of the Taconic Allochthons (displaced Iapetos Terrane), Early Paleozoic age

Marble, schist and quartzite of a continental shelf sequence, Early Paleozoic age

Gneiss (includes granitic gneiss) and schist of "Grenville" basement, Proterozoic Y age (~1.1 billion years old)

AVALONIAN (CONTINENTAL) terrane

Proterozoic Z age (600-700? million years old) metamorphosed sedimentary and igneous rocks and Middle Paleozoic age (~370 million years old) metamorphosed igneous rocks

Gneiss (includes granitic gneiss), schist and quartzite -- Hope Valley belt, Proterozoic Z age

Gneiss (includes granitic gneiss) of Proterozoic Z age intruded by Middle Paleozoic granitic plutons -- Esmond-Dedham belt

SELECTED PLUTONIC ROCKS

Granite, nonfoliated, Late to Middle Paleozoic age (270-370 million years old)

Gabbro and related rocks, Middle Paleozoic age (350-450 million years old)

Print

RENEWABLE ENERGY W

Researchers Examine New England's EGS Potential

By Janet Lathrop, UMass Amherst News Office | November 10, 2010

Because the region is comprised of granite, there may be huge geothermal energy resources two to four miles underground.

University of Massachusetts Amherst geologists say that hot rocks beneath granite-rich New England -- way down, 2.5 to 4 miles deep -- could represent the next great clean energy source, with a potential to generate enough local electricity and direct heat to serve small towns, schools and hospitals.

Harnessing local geothermal energy for such systems -- not from volcanoes or geysers but from garden-variety rocks found in certain special granites -- has the potential to cut electricity costs by 25 percent to 50 percent, according to the National Renewable Energy Laboratory at the Department of Energy (DOE). Many businesses are waiting with new technologies designed to take advantage of this potential new source.

Now, DOE is investing in practical new geothermal research through a grant via the American Association of State Geologists. Steve Mabee, the Massachusetts state geologist, and Mike Rhodes, professor of volcanology at UMass Amherst, with Margaret Thomas, the Connecticut state geologist, recently received a three-year, $441,062 grant to conduct the first comprehensive survey of geothermal energy potential of the rocks in the Northeast. Their work will also be used to create a national geothermal database for the entire country.

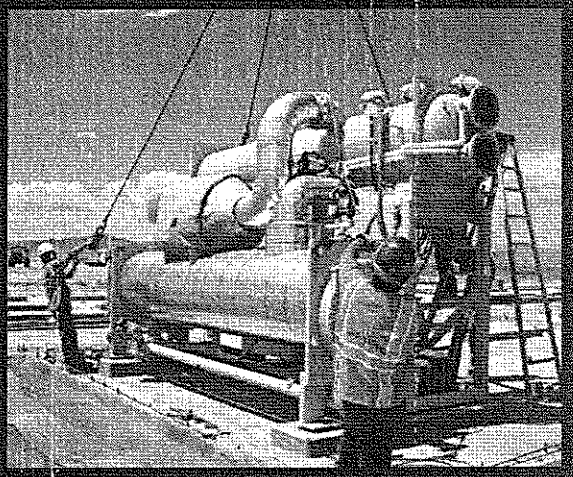
"I think of geothermal power as the Cinderella of alternative energy," says Rhodes. "Most people don't pay it any attention. It's really an attractive alternative. Unlike wind and solar energy, it works 24 hours a day, seven days a week, is unobtrusive and environmentally friendly. You don't need volcanoes or geysers to have an opportunity to tap geothermal energy. Most of the Earth below our feet is very hot. It's just a matter of knowing where to tap it."

New England is endowed with abundant granites and gneisses that generate heat deep within the earth and are a potential source of local energy, say Mabee and Rhodes. Some developed countries, notably Switzerland, France, Australia and the U.K., are ahead of the United States in developing this type of geothermal resource, "but that's going to change," predicts Rhodes. "Many write off New England's potential, but we certainly do not agree. After all, 33 percent of the state is underlain with granitic rocks."

Mabee adds, "What we propose is to see how hot our rocks are and where they are located. Drilling methods are improving, the technology for transferring energy from deep underground is advancing and economic conditions may soon make it more cost-competitive. So when towns and businesses start asking where to drill to tap that heat source, we'll be ready. That's the position we want Massachusetts to be in."

A post-doctoral researcher and several undergraduates supervised by Mabee and Rhodes will be collecting about 450 samples across the two states as part of the survey. They'll bring rocks back to Rhodes's UMass Amherst laboratory, where crushed and powdered samples will be analyzed by X-ray spectrography.

Green Jobs Through Geothermal Energy



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October 2010

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stages. Of course, some companies may be vertically integrated with "in-house" operations, but most will contract out for many services related to exploration, drilling, construction and manufacturing.

Even for more permanent jobs, such as power plant operation and maintenance, this proves the rule. The GEA employment survey noted earlier found that subcontractors typically represent about 42% of the power plant operator's own workforce and 30% of total employment involved in power plant operation and maintenance (O&M).[i]

Indirect employment

Indirect employment refers to the jobs that are created in all the industries that provide goods and services to the companies involved in power plant construction or operation and maintenance. A drill rig, for example, might require 20 rig hands for its direct operation, but, according to the American Petroleum Institute, as many as 120 jobs may be required to support its operation.[ii] This larger number is comprised of direct AND indirect jobs, of which the latter are typically subcontracted out to other vendors and are necessary to support all activities of the drilling operation. The range of indirect jobs throughout all aspects of resource development is extensive, and would include government regulators, lawyers, architects, equipment service personnel, geologists, business management personnel, security guards, and many more.

Induced employment

Increased economic activity in a region with new direct and indirect jobs means additional new jobs that may not be directly related to the geothermal industry but are supported by it. Induced employment refers to jobs that are created to serve the workers, subcontractors and others that are counted in direct or indirect employment.

1.2.2 Methodology

The direct jobs for geothermal projects were identified and accounted for by GEA as part of its examination of industry data, responses to a detailed survey, and other direct methods. Indirect and induced impacts were calculated with "input-output models" that provide a comprehensive picture of the economy considered. The result was an estimate of jobs that would identify the number of full-time jobs created per megawatt of geothermal capacity added, and the number of person-years of manufacturing or construction jobs created. Since manufacturing and construction jobs are not permanent, the use of person-years expresses the jobs in terms of employment on a full-time basis equivalent for one year. While construction and manufacturing jobs are expressed as full-time positions for one year (person-years), these jobs will be spread

power plant construction. The total direct, indirect and induced impact of these advanced geothermal projects would represent up to 2,805 full-time jobs.

1.2.4 Job Quality

Not only does geothermal energy provide more jobs than conventional energy technologies, it also provides quality, long-term jobs. According to the EIS/EIR for the proposed Telephone Flat geothermal development project located in the Glass Mountain Known Geothermal Resource Area in California, the average wage at the facility will be more than double the average wage in surrounding counties. According to the U.S. Census Bureau, the average per capita income in 1999 in the closest counties was around $21,000, with the average California per capita income nearly $2,000 higher.[vii] The average projected wage related to operation at the Telephone Flat facility would be higher than both the county and state averages, totaling between $40,000 and $50,000 (1998 $).[viii]

In addition to providing high average-wage jobs geothermal energy supports long-term employment. Geothermal developers, who typically negotiate 10- to 30-year agreements with purchasers, provide jobs that can be guaranteed for decades. The overwhelming majority of geothermal jobs are permanent (95%), and most are also full-time.[ix]

1.2.5 Rural Employment

Geothermal resources tend to be located in rural areas and require the support of the local workforce. For example, of the staff employed directly by one company at the Geysers Geothermal Complex in California, 425 full-time and 225 part-time employees are residents of the local community.[x] Rural communities face many unique challenges. The lack of stable, secure, long-term jobs in rural communities leads many young adults with "the most education and the greatest earning potential" to emigrate, leaving a poorer, older, and smaller population.[xi] Many rural communities, including those in which geothermal facilities tend to be located, suffer from significantly higher unemployment rates than the general population. In 2004, California's unemployment rate was 6.2%, but Siskiyou County, near the proposed Telephone Flat geothermal power plant, had an unemployment rate of 9.3%, more than one-third higher than the California average.[xii] The Center for Mental Health Services (CMHS) found that "many rural Americans are at or below the national poverty level."[xiii] Unemployment in rural communities makes residents particularly susceptible to high levels of social and health-related problems—more so than their urban counterparts.[xiv]

1.3 Future Potential and New GEA Analysis

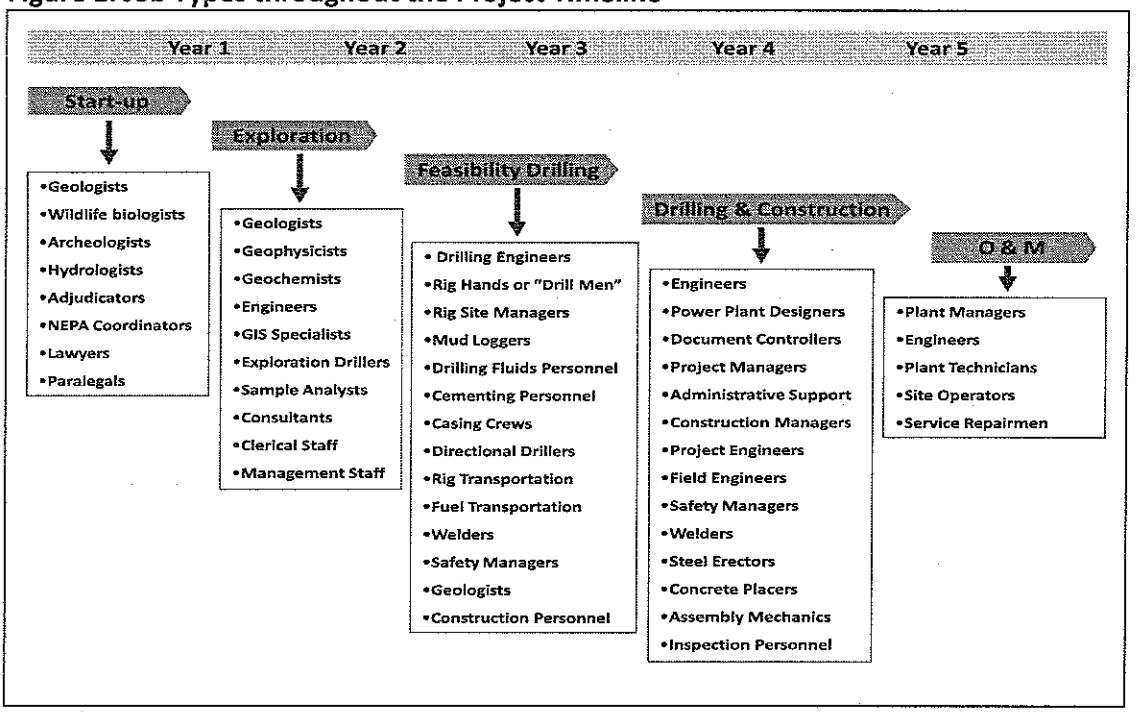
The development of geothermal energy resources has the potential to generate and support numerous "green jobs" in the US. Geothermal projects that are currently in advanced stages of development in the states of Nevada, California, and Utah alone have the potential to create more than 2,500 permanent full-time positions and nearly 10,000 annual construction jobs. However, numbers don't always tell the complete story regarding the many and diverse jobs supported throughout the development of a geothermal resource. Section 2 will endeavor to walk through a geothermal project from start to finish, and will discuss both the types of jobs and the number of people involved at each stage in the development process. The information gathered by GEA for this analysis indicates that one typical 50-MW geothermal power plant can involve up to 860 different people with a wide range of skills over its development cycle. Some of these jobs will be "on-site" where the power plant is located, others can be in nearby major cities, and others can be found in manufacturing plants hundreds of miles from the actual geothermal resource.

2.1 Job Generation Throughout the Development Timeline

Currently, the US leads the world in installed geothermal capacity with approximately 3086 MW of geothermal power on line.[xvii] While this number is large, the vast majority of geothermal resources in the US remain undeveloped. In 2008 the US Geological Survey (USGS) estimated that potentially 73,286 MW of unidentified and 16,457 MW of identified conventional hydrothermal geothermal resources remain undeveloped in the US. When also including the development potential of enhanced geothermal systems (EGS) this number significantly increases.[xviii]

The development of US geothermal energy resources not only means the increased use of clean, baseload renewable energy to offset fossil fuel use in electricity production, but it also provides another important benefit: green jobs. The development of a geothermal resource is a significant undertaking requiring the input of degreed and technical professionals as well as the work and support of numerous green-collar workers. Many of the jobs supported during geothermal resource development play their most prominent roles in specific phases of the resource development timeline.

Figure 1: Job Types throughout the Project Timeline



Source: GEA

While a particular job may be featured during early or latter stages of resource development, it is evident that harnessing US geothermal resources will not only

or private land, state and local governments perform their own permitting activities similar to those of the BLM.[xxi]

2.3 Exploration

Prior to initiating subsurface development of a geothermal reservoir, a developer will conduct a series of geothermal exploration activities in order to improve the chances of drilling successful production wells. Exploration activities may include airborne, geological, geochemical, and geophysical surveys. The drilling of temperature gradient wells, core drilling, or other drilling operations are examples of other exploration activities. The variety of skilled professionals and laborers needed to support geothermal exploration activities is summed up in Table3.

The exploration of a geothermal resource requires the expertise of professionals with both undergraduate and advanced degrees in geology, geophysics, geochemistry, engineering, and geographic information systems (GIS). The work also calls for the technical expertise of green-collar workers to support exploration drilling and the gathering of geophysical data.

Consulting and management professionals are also needed to support development efforts. At least one to two consultants from an outside company will usually be contracted by a developer to review and provide a professional assessment of geothermal exploration data.

Table 3: Jobs Types Involved in Geothermal Exploration

Job Title	Educational Background	Number Employed
Geologist	Grad. Level	1 – 2
Geophysicist	Grad. Level	1 – 2
Crew to Gather Data	Undergrad. Level, Technical	2 – 5
Geochemist	Grad. Level	1
GIS Specialist	Grad Level, Technical	1
Exploration Driller	Undergrad.-Grad. Level, Technical	3 – 7
Sample Analyst	Grad. Level	1 – 2
Consultants	Grad Level	1 – 2
Estimated Total		**11 – 22**

Source: GEA, UNR

Federal agency staff also play an integral role in permitting certain exploration activities as well as facilitating environmental assessments. Additionally, clerical staff and professional management from the development company are involved in geothermal exploration, the preparation of environmental assessments, and permitting.

Table 5: Vendor Job Types Involved in Geothermal Drilling

Job Title	Description	Number Employed
Casing Personnel	Installs metal casing in the geothermal wellbore after drilling is complete	4 – 5
Directional Drilling Personnel	Operates and oversees the directional drilling of a geothermal well	5 – 7
Well Logging Contractor	Operate downhole well logging equipment	2
Geologist	Utilize geologic techniques and expertise to help mitigate drilling risk	3 – 10
Rig Transporter	Operates transportation needed to move the drill rig from one job site to the next	25
Fuel Transporter	Operates transportation needed to deliver fuel to the drill site	20
Estimated Total		**59 -69**

Source: GEA, ThermaSource

Drilling a geothermal well also includes important behind-the-scenes work of administrative and managerial teams that direct, manage, and support geothermal drilling operations. While difficult to quantify, these supporting personnel make up a significant number of employees working to develop geothermal energy.[xxiii]

2.5 Plant Design and Construction

Once the geothermal developer has determined the commercial viability of a resource and has accurately characterized the subsurface reservoir, they will often enter into an engineering, procurement, and construction (EPC) contract. The EPC contractor will utilize its own team of employees as well as subcontracted workers. As a result, geothermal power plant design and construction supports a diverse and significant number of jobs.

The planning and design of a geothermal power plant begins before construction actually commences at the plant site. During the power plant design and engineering phase of geothermal resource development, some 40 to 50 people of varying expertise and skill sets will be employed in the planning process (see Table 6 below).

Table 7: Jobs Types involved in EPC Phase (Plant Construction)

Job Title	EPC Team or Contractor
Construction Manager	EPC Overhead Staff
Project Engineer	EPC Overhead Staff
Field Engineer	EPC Overhead Staff
Project Superintendent	EPC Overhead Staff
Safety Manager	EPC Overhead Staff
Document Controller	EPC Overhead Staff
Admin. Support	EPC Overhead Staff
Welder	Subcontractor or Craftsperson
Assembly Mechanic	Subcontractor or Craftsperson
Inspection Personnel	Subcontractor or Craftsperson
Concrete Construction Operator	Subcontractor or Craftsperson
Steel Erector	Subcontractor or Craftsperson
General Construction Personnel	Subcontractor or Craftsperson
Estimated Total	**340 – 440**

Source: GEA

The plant construction stage typically takes around 2.5 years, and the number of subcontractors or craftspeople on the job site varies throughout this time. During initial phases these numbers remain small but peaks at around 300 to 400 employees toward the final stages. The number of people employed in constructing smaller geothermal power plants decreases but not necessarily proportionally to a decrease in power plant capacity; the number decreases only 25% for a 25-MW power plant compared to employment levels at a 50-MW plant.

2.6 Manufacturing

Geothermal power plants are made of many parts which, when assembled, make up relatively complex mechanical and electrical systems. For example, an organic rankine cycle geothermal plant will be composed of expanders, generators, pumps, heat exchangers, valves, refrigerant, steelwork, cooling towers, piping, switchgear, and transformers. These different parts must be individually manufactured prior to being incorporated into the overall power plant in a design and construction process that involves mechanical engineers, electrical engineers, performance/systems engineers, quality and manufacturing engineers, maintenance engineers, procurement specialists, mechanist, electricians, welders, assembly mechanics, inspection personnel, shipping personnel, maintenance technicians, and site operators.

The system that actually generates electricity, the power unit, is one of the central features of any geothermal power plant. The manufacturing of a single power unit requires the effort of a large team of professionals. One supplier estimates that some

2.7 Operation and Maintenance

Once a geothermal power plant is operational, a number of professionals are employed by the owner and operator to maintain and operate it. Power plant managers, engineers, maintenance technicians, and site operators are employed at the site. The total number of people employed can range from 10 to 25 operation and maintenance personnel.

In addition to on-site and other O&M personnel employed by the geothermal power plant owner and operator, support and repair services are also required to maintain plant operations. For example, the supplier of the turbines used in a geothermal power plant will also provide repair services as well as new parts to ensure that the product they sold to the plant owner and operator runs smoothly. One supplier estimated that the continued operation of a geothermal power plant can support up to 19 service and repair jobs.

Turbines are just one example of the many working parts needing vigilant attention and maintenance in a geothermal power plant. Such a plant can be thought in three parts: the power generating unit, the steam gathering system, and the subsurface geothermal reservoir. The latter two parts also require regular maintenance over the life of the plant. Production and injection wells may need to be periodically reworked to ensure adequate fluid and steam flow and injection. As time goes on, it will usually be necessary to drill a new make-up well from time to time to maintain the flow of high-temperature geothermal. Additionally, the piping in steam gathering systems must be maintained and periodically replaced due to wear and tear. One geothermal developer noted that two of its power plants at The Geysers, California accounted for 67 production wells, 10 injection wells, 102 miles of underground well pipe, 8 miles of steam gathering pipe, and 5 miles of injection pipe. This constitutes a substantially large geothermal infrastructure, outside of the actual power plant, that not only requires a significant amount of manpower to construct but also a large number of professional workers to operate and maintain.[xxv]

2.8 Conclusion

The US has the potential to significantly bolster levels of employment by further developing its geothermal resources. From the early stages of leasing, permitting and exploration, to components of the geothermal supply chain, to later stages of production well drilling and plant construction, and finally, the continued operation and maintenance of a plant, geothermal project employs large numbers of professionals and supports a growing green collar industry. When considering the complex nature of the geothermal supply chain, as well as continued plant operation and maintenance, the

3. References

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[iv] This table is included for comparative purposes only. While these geothermal employment numbers are not consistent with GEA's updated employment information, GEA chose to include this table, endorsed by US DOE, in order to show how geothermal's employment figures compare with natural gas'. GEA has chosen to include these slightly outdated figures because they allow an even comparison between natural gas and geothermal. As we do not have updated natural gas figures, we cannot update only the geothermal figures for the purpose of comparison.

[v] See glossary for definitions

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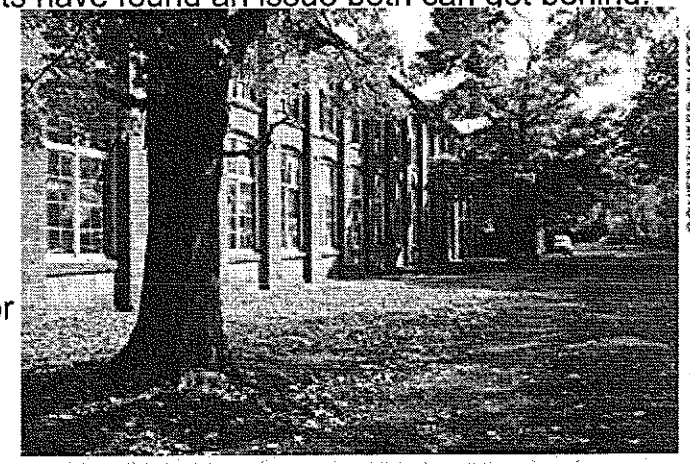
FOCUS ON REAL ESTATE AND CONSTRUCTION

Business, DEP Want More Brownfield Redevelopment

Finding dedicated funding source, speeding review process are keys

By Brad Kane
bkane@HartfordBusiness.com
Today

Rarely do developers and the Connecticut Department of Environmental Protection agree on anything, but businesses and environmentalists have found an issue both can get behind.



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The road that runs behind the Remington Rand building in Middletown, the site of a massive city clean-up and development.

Cleaning up blighted and contaminated properties for redevelopment is the best way to improve the environment, grow industry, increase tax rolls and reduce sprawl all at once.

Connecticut has thousands of opportunities for brownfield remediation — more than 13,000 — and the issue isn't getting quality projects done. It's getting more of them done.

"It is the only issue that I know of where everyone is on the same side," said Eric Brown, associate counsel for the Connecticut Business & Industry Association. "It is really a win all around. It's hard to find a downside."

Out of the more than 13,000 brownfield sites in Connecticut, 47 have been remediated since 1996. The state has committed $121.6 million to those efforts.

Goodwin College in East Hartford sits on a formerly contaminated property, a remediation effort that won the state the 2010 Project of the Year Award from the Northeastern Economic Developers Association. Pfizer built a facility in New London on a brownfield peninsula; same for the Brass Mill Center in Waterbury.

The 113-year-old Remington Rand complex in Middletown was quite the project for the town and its contractors to pull together — as the complex has polluted the nearby soil, groundwater and Mattabessett River for years — but with some creativity, the city-owned complex is now nearing 20 new tenants.

"It was pretty easy once it got planned out," said Al Warren, Stafford Springs contactor who

product.

As co-chair of the Commerce Committee, Berger has worked for five years to change the state's mindset on how brownfield redevelopment is funded and accomplished. A dedicated source of funding needs to be set aside for clean-up of these sites so they are shovel-ready for developers. And Berger believes he has the funding answer, even in the budget crisis.

Two years ago, Berger worked on a bill that called for taking $100 million of recording and filing fees out of the state's general fund and putting it toward brownfields. While the measure passed the House, the Senate changed it to award the money to dairy farmers.

Now that two years have passed, Berger wants to reallocate that money to brownfields. That way, the remediation has a solid source of funding for multiple projects, instead of relying on state bonding for individual projects.

"We just need to do more of these projects. Right now, we can only do three or four per year," Berger said. "We need money to make it happen."

The end result of brownfield redevelopment often depends on the community, Simmons said. There are housing projects, commercial developments, new manufacturing sites, research facilities; municipalities such as Bridgeport, Meriden and Norwalk have converted them to parks and other open space.

"It is really gratifying when you attend these ribbon cuttings where there properties that were really in bad shape become a positive for the community," Simmons said.